

# Exercises

1. Round a float to the nearest integer using `int()`.
2. What does this do? `round(amount * 10)/10.0`. How to round it to the nearest 5 paise?
3. Print out the fibonacci sequence less than 30
4. Write a program that prints the numbers from 1 to 100. But for multiples of three print "Fizz" instead of the number and for the multiples of five print "Buzz". For numbers which are multiples of both three and five print "FizzBuzz". This is famously known as the FizzBuzz test.
5. Write a program that displays all three digit numbers that are equal to the sum of the cubes of their digits. That is, print numbers  $abc$  that have the property  $abc = a^3 + b^3 + c^3$ . These are called *Armstrong numbers*.
6. Collatz sequence
  1. Start with an arbitrary (positive) integer.
  2. If the number is even, divide by 2; if the number is odd multiply by 3 and add 1.
  3. Repeat the procedure with the new number.
  4. There is a cycle of 4, 2, 1 at which the procedure loops.

Write a program that accepts the starting value and prints out the Collatz sequence.

7. Kaprekar's constant
  1. Take a four digit number—with at least two digits different.
  2. Arrange the digits in ascending and descending order, giving A and D respectively.
  3. Leave leading zeros in A!
  4. Subtract A from D.
  5. With the result, repeat from step 2.

Write a program to accept a 4-digit number and display the progression to Kaprekar's constant.

8. Write a program that prints the following pyramid on the screen.

```
1
2 2
3 3 3
4 4 4 4
```

The number of lines must be obtained from the user as input. When can your code fail?

9. Write a function to return the gcd of two numbers.
10. Write a program to find Primitive Pythagorean Triads A pythagorean triad  $(a,b,c)$  has the property  $a^2 + b^2 = c^2$ . By primitive we mean triads that do not 'depend' on others. For example, (4,3,5) is a variant of (3,4,5) and hence is not primitive. And (10,24,26) is easily derived from (5,12,13) and should not be displayed by our program. Write a program to print primitive pythagorean triads. The program should generate all triads with a, b values in the range 0—100
11. Write a program that generates a list of all four digit numbers that have all their digits even and are perfect squares. For example, the output should include 6400 but not 8100 (one digit is odd) or 4248 (not a perfect square).
12. The aliquot of a number is defined as: the sum of the *proper* of the number.  
For example, the `aliquot(12) = 1 + 2 + 3 + 4 + 6 = 16`.  
Write a function that returns the aliquot number of a given number.
13. A pair of numbers (a, b) is said to be *amicable* if the aliquot number of a is b and the aliquot number of b is a.

Example: 220, 284

Write a program that prints all five digit amicable pairs.

14. Given an empty chessboard and one Bishop placed in any square, say (r, c), generate the list of all squares the Bishop could move to.
15. Write a program to display the following pyramid. The number of lines in the pyramid should not be hard-coded. It should be obtained from the user. The pyramid should appear as close to the centre of the screen as possible.

```
  *
 ***
*****
*****
```

16. Write a program to display the following pyramid. The number of lines in the pyramid should not be hard-coded. It should be obtained from the user. The pyramid should appear as close to the centre of the screen as possible.

```
  *
 * *
* * *
* * * *
```

17. Write a program to display the following pyramid. The number of lines has to be a parameter obtained from the user. The pyramid must appear aligned to the left edge of the screen.

```
1
2 2
3 3 3
4 4 4 4
```

18. Write a program to display the following pyramid. The number of lines has to be a parameter obtained from the user. The pyramid must appear aligned to the left edge of the screen.

```
1
2  4
3  6  9
4  8 12 16
5 10 15 20 25
```

19. Write a program to display the following output. The last number where the program will stop printing has to be a parameter obtained from the user. The pyramid must appear aligned to the left edge of the screen. Note that depending on the last number, the base of the pyramid may be smaller than the line above it.

```
1
2  3
4  5  6
7  8  9 10
11 12
```

20. Given a string like, "1, 3-7, 12, 15, 18-21", produce the list [1,3,4,5,6,7,12,15,18,19,20,21]
21. You are given date strings of the form "29, Jul 2009", or "4 January 2008". In other words a number a string and another number, with a comma sometimes separating the items. Write a function that takes such a string and returns a tuple (yyyy, mm, dd) where all three elements are ints.

22. Count word frequencies in a file.
23. Given a dictionary of the names of students and their marks, identify how many duplicate marks are there? and what are these?
24. Given a string of the form "4-7, 9, 12, 15" find the numbers missing in this list for a given range.